

THE USE OF

1936

2nd ed.



FERTILIZERS

ON PRAIRIE SOILS

FOREWORD

The material contained in the following paper is submitted to give the reader a better understanding of the reason for the intelligent use of fertilizers in the Prairie provinces of Western Canada, a subject which is so little understood by the average farmer.

Fertilization of the major crops in Western Canada has come to be a recognized necessary practice. Three years' experimental work, in co-operation with the various governmental organizations, and with an additional five years' sales of fertilizers in this area has conclusively proven the need of intelligent fertilization of the prairie soils.

It is not inopportune to state at this time that fertilization of the prairies calls for different methods than have been commonly used in other countries, where climatic conditions differ widely.

When one understands and appreciates the close inter-relationship of chemical and biological activities in soil fertility, plant nutrition, and climate, the necessity of fertilizing Canadian prairie soils is obvious, and many of the former opinions on fertilizer of prairie soils, based on the older ideas of static soils, must be abandoned.

Soils are living dynamic substances, and fertilization methods and recommendations must be based upon this fact.

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RAY E. NEIDIG

Director of Agriculture.

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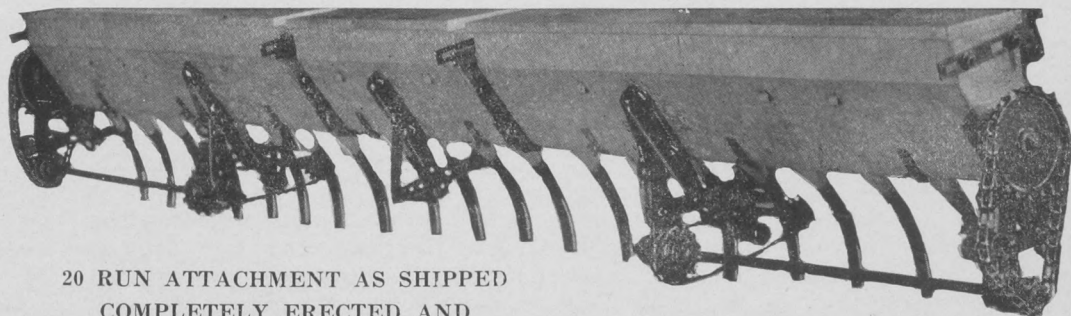
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TRAIL—BRITISH COLUMBIA

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FERTILIZERS

SOIL FERTILITY

THE maintenance of soil fertility is most important in building a permanent system of agriculture in every country. Soil fertility may be defined as the productive power or cropping capacity of a soil. This capacity can be measured by the rate that plant food is made available to growing crops.

Any system of farming that does not provide some means of supplying the soil with the elements of plant food removed by the crops will be found inadequate in maintaining a high average yield.

A fertile soil, in the ordinary sense of the word, is one that will yield profitable returns in the form of crops. Such a soil must be supplied with sufficient moisture to produce a crop; it must contain organic matter, the substance that improves the texture, increases the water holding capacity, and in general improves soil tilth, and it must also contain plant food in a readily assimilable form, made available at a rate sufficient for normal growth.

TOTAL SOIL ANALYSIS—ITS VALUE

The greater portion of the plant food of a soil is locked up in inert forms, i.e., in forms incapable of being used by the plant. While, therefore, a soil may contain large potential reserves of plant food, it may be unable to support the growth of a profitable crop, due to the fact that these inert supplies are not in an available form, and are not made available rapidly enough for crop needs.

A total soil analysis will determine the extent of this potential supply, but it will not tell us the rate at which it is made available to the crop, nor the quantities of available constituents present at any given time.

A field trial is therefore the surest method of determining the fertilizer requirements of a soil. This method consists in sowing a series of plots, one plot without fertilizer, the others with different fertilizers, and different rates of the same fertilizer. In this manner the response of a soil to certain fertilizers can be determined under exact soil and climatic conditions.

PLANT FOODS

Nitrogen, phosphorus and potassium are three constituents required in an available form, and in fairly large quantities by a crop. Other plant food elements are supplied to the crops by the soil, but these are not usually required in larger quantities than the soil can provide.

Nitrogen promotes stem and leaf growth, and increases the feeding value of the stalk and leaves of the plant. It is necessary in the production of a high protein wheat. The presence of available nitrogen gives the crop its deep dark coloring during the early growth period.

Phosphorus promotes earlier and greater root development, and provides the plant with a greater feeding range. It increases

stooling, speeds up early growth, and brings about early maturity. All seeds contain relatively large quantities of phosphorus, consequently we do not obtain the maximum yields of seed when soils are deficient in available phosphoric acid.

These plant foods are required in varying amounts by the various crops, and a deficiency in any one of them may prove the controlling factor in the production of a crop. Normal plant growth depends on a properly balanced plant food supply.

SOILS OF WESTERN CANADA

The prairie soils are relatively low in total phosphorus, high in total potassium, and vary in their nitrogen content. They have therefore shown their greatest response to fertilizers containing phosphorus and nitrogen.

The wooded soils of Western Canada, a class of soils found across the northern portions of the three prairie provinces, require special fertilizer treatment. These soils are found in the heavier timber areas, and are distinguished by the white leached appearance of the plow layer.

Their lack of fertility is due to a low content of organic matter, nitrogen, phosphorus, and in some areas sulphur. Fertility is most quickly restored by growing a heavy crop of green legumes by fertilizing with (16-20) Ammonium Phosphate, plowing under a portion of the green manure to increase the organic matter of the soil, then growing grain crops fertilized by (16-20) Ammonium Phosphate.

In some areas, Ammonium Sulphate applied to legumes gives large economic increases in yields, but growing legumes with Ammonium Phosphate is the general recommendation, since it supplies nitrogen, phosphorus and sulphur minerals. These added minerals, along with the increased organic matter of the soil resulting from plowing under the legume crop, as well as the heavy root system produced by fertilization, has produced high yields of legumes and grain crops on these wooded soils.

CULTURAL PRACTICES AND THEIR EFFECT ON SOILS

The cultural practices of the grain farmer in Western Canada are varied. They are all designed, however, to place the soil in a condition best suited to the production of a maximum crop.

The practice of summerfallowing is used extensively. It helps to control weeds, stores moisture, and transfers a portion of the insoluble plant food to the available form. It does not add plant food, but is one of the common means of liberating it in the soil.

The plowing under of a green manure crop increases the supply of organic matter in the soil, and, where legumes are grown, adds nitrogen, through the power of these crops to fix this element from the atmosphere.

Green manuring does not add phosphoric acid nor potash to a soil. Hay crops are heavy users of these minerals, and where part of the crop is used for hay, plant food is removed from the soil in large quantities.

Plant foods are removed from the land in the form of grain and

THE CONSOLIDATED MINING

hay crops, and are sold by the farmer, either directly as hay and grain, or in a manufactured form such as milk, beef or pork.

If the crops are marketed directly as such, the plant food removed is a direct loss to the land; where the crops are fed to live-stock on the farm, a certain portion of the plant food can be returned to the soil in the form of barnyard manure. In either case, however, certain plant foods are definitely removed and will have to be replaced if the farm is to continue raising profitable crops.

BARNYARD MANURE

Barnyard manure is of little importance on the large wheat farms of Western Canada, because so little of it is produced.

It is produced in fairly large quantities in a few mixed farming districts where crops grown on the farm are fed to live stock. In such areas barnyard manure should be considered as a means of supplying a portion of the plant food which must be returned to the soil.

One ton of average barnyard manure contains 14 pounds of nitrogen, 5 pounds of phosphoric acid, and 11 pounds of potash.

Manure is not a balanced fertilizer in that it contains more potash and nitrogen than phosphoric acid. It is also a low grade fertilizer containing relatively few pounds of plant food per ton, 9 tons containing approximately the same quantity of phosphoric acid as would be supplied by 100 pounds of triple superphosphate.

Fertilizers designed for prairie conditions must be high in phosphoric acid because of the general deficiency of this plant food in these soils. Manure can therefore be more economically applied by reducing the rate of applications and supplementing it with from 30 to 60 pounds of triple superphosphate per acre. Such a practice will make it possible to manure larger areas, and will provide the plant food elements in the proper proportions.

The applications of large quantities of manure tends to delay ripening, due to excess nitrogen and lack of phosphoric acid, or an unbalanced plant food condition. A balanced plant food supply promotes early maturity, a condition of vital importance to the prairie grain farmer.

It can readily be seen, therefore, that only a part of the plant food removed by a crop is returned in the form of manure, and that it is impossible for the average stock farmer to maintain the fertility of his farm with the manure produced on it. A portion of the plant food must therefore be supplied in some other form, and this is most economically accomplished through the use of high grade commercial fertilizers.

GREEN MANURING

Crop rotation practices, in which certain crops are grown and plowed down as green manures, improve the tilth and water holding capacity of a soil through the addition of organic matter.

When legumes are grown for green manuring, nitrogen is added to the soil through the power of these plants to fix atmospheric nitrogen. Phosphoric acid and potash, however, cannot be added in

this way, and where the early cuttings of the legume crop are used as hay, large quantities of these elements are removed from the soil. Such systems of crop rotation are valuable in helping to maintain soil fertility, but they must be supplemented by other sources of plant food if the soil is to continue producing maximum yields.

REASONS FOR USING COMMERCIAL FERTILIZERS

The object of using fertilizer is to supplement the supplies of available plant food in our soils to such an extent as to enable a full crop to be grown. Under our cool short seasonal conditions, when a crop must be produced in the shortest time possible, plant food must be made available at a rate, and in sufficiently large quantities, to supply the growing crop with available plant food continuously throughout the entire growth period.

The period in Western Canada during which growing conditions exist, is so short that plant food is neither made available at the proper time, nor in sufficient quantities, and consequently crops may be temporarily retarded. This is particularly true during the first few weeks of the growing season, and for this reason, and the fact that our soils are low in phosphoric acid, we obtain responses when small applications of fertilizer are placed in the drill row with the seed.

Plant foods must be available in order to benefit the growing crop, and cultural practices are designed to create conditions under which plant foods are made available through the natural soil processes.

Applications of available nitrogen in the form of Ammonium Phosphate, have given responses on fields heavily manured with green legume manures, due to the fact that the nitrogen in green manures must first be made available before it can be used by the following crop.

CROP RESPONSES TO PHOSPHATE FERTILIZER

The results of drilling Ammonium Phosphate Fertilizers in with the seed are:

1. Increased root development with the establishment of a large feeding range, both for plant food and moisture.
2. Earlier and more rapid growth.
3. Increased stooling, and a more uniform stand of grain.
4. Conservation of moisture through obtaining early spring growth, covering the bare soil with the crop, and in this manner reducing evaporation.
5. More economical use of moisture as shown by a lower transpiration ratio. In other words, less water is required to produce a pound of dry matter in a crop properly supplied with plant food, than where there is an unbalanced plant food condition.
6. Weed control in fertilized crops.
7. Increased resistance to plant diseases, insect pests and soil drifting, due to the production of fast growing, vigorous, healthy grain plants.
8. Earlier maturity, important in areas of early frost and rust, resulting in a better quality of grain for the market.

HIGH ANALYSIS FERTILIZERS

The present trend in the use of fertilizers is towards the highly

concentrated forms, as the saving in freight and handling charges is considerable, and the cost per pound of plant food to the user is lowered.

The Consolidated Mining & Smelting Company of Canada Ltd. manufacture the following fertilizers for use on the Canadian Prairies. These fertilizers are of granular composition, clean to handle, and due to the uniformity of product are particularly suitable for even distribution to crops.

(11-48) Ammonium Phosphate, containing 11% of available nitrogen and 48% of available phosphoric acid.

(16-20) Ammonium Phosphate, containing 16% of available nitrogen and 20% of available phosphoric acid. (Recommended for wooded soil areas.)

Ammoniated Triple Superphosphate, containing 43% of available phosphoric acid.

Ammonium Sulphate, a nitrogen fertilizer containing 20.5% of available nitrogen, and 24.0 per cent sulphur.

Also complete fertilizers for special purposes.

Fertilizers are sold on the basis of their plant food content, and it is only through a comparison of the guaranteed percentages of these constituents that the various fertilizers can be evaluated and compared.

METHODS OF APPLYING FERTILIZER TO GRAIN CROPS

Under prairie conditions the best results are obtained when the fertilizer is drilled in with the seed by means of a fertilizer attachment or a combination drill. Broadcasting of fertilizers does not give the best results and will not be found satisfactory.

Care must be taken to obtain an even distribution of the fertilizer in the grain row, and to place the grain and fertilizer in the moist soil.

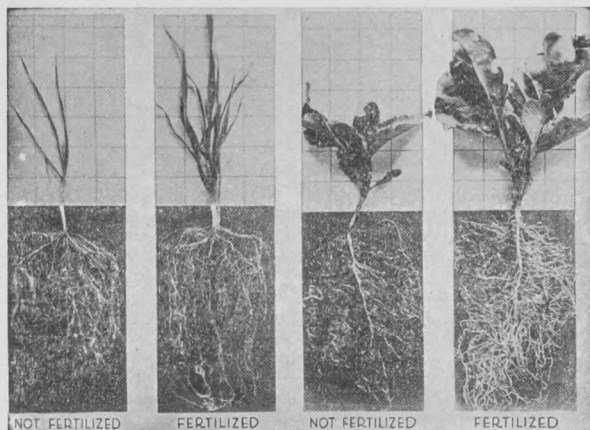
New machinery for the efficient distribution of concentrated granular fertilizers has been developed by our company. A cheap and efficient attachment (The Universal) is designed to fit practically all makes of grain drills and grain seeding appliances.

Fertilized crops should be planted as soon as weather and soil conditions will permit, as many of the benefits derived through the use of fertilizer are due to vigorous growth and rapid root development during the early part of the growing season.

Placing concentrated fertilizers in the drill row with the seed permits the use of small applications of fertilizer per acre. The grain seed receives the benefit of the fertilizer while the weeds between the drill rows are not benefited. The increased efficiency obtained by placing the plant food within reach of the young plant is readily seen, particularly in the cool weeks following seeding, when under ordinary conditions crops may stand still, sometimes for a considerable period.

FERTILIZERS NOT A CURE-ALL

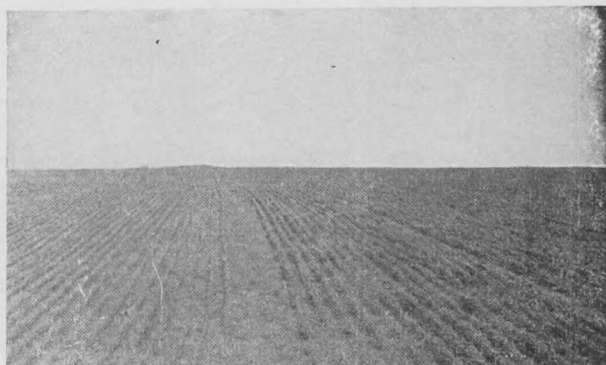
The use of fertilizer must not be regarded as a cure-all for poor farming methods. Experiments, it is true, have shown benefits on



Fertilized wheat shows greater and more rapid root development, stronger stalk and more tillering.

Fertilized beets show greater and more rapid development of roots and tops.

Fertilized wheat shows greater resistance to wind blowing and soil drifting.



Not Fertilized

Fertilized



Left—Fertilized

Right—Not Fertilized

Fertilized grain makes more rapid growth in the early spring when soils are cold and the action of soil bacteria is retarded.

Unfertilized crops appear to stand still.



Not Fertilized

Fertilized

Fertilized grain
reduces wire
worm damage.

Note the absence
of stubble in the
unfertilized grain
caused by wire
worm damage.



Fertilized wheat
shows greater
resistance to
cutworm damage,
also earlier
maturity.

Not Fertilized

Fertilized



Fertilized

Not Fertilized

Fertilized beets
resist damage
from black root
disease.



Drilling in
fertilizer with
wheat reduces
loss from wild
oats and other
weeds.

Fertilized

Not Fertilized

Fertilized wheat
shows less weed
growth, more
uniform stand,
even ripening,
increased yield,
earlier maturity,
better utilization
of moisture.
More even
ripening aids in
combine
harvesting.



Fertilized

Not Fertilized



Fertilized wheat
shows earlier
heading, less
weed growth.



Not Fertilized

Fertilized

Fertilized grain grows rapidly, more economical of soil moisture, and matures earlier. Less danger of loss of crop from early Fall frosts.

Fertilized wheat shows stronger straw, heavier yield, and earlier maturity.



Fertilized potatoes show higher yields and a higher per cent. of marketable potatoes.

poorly farmed lands, but the increases in yields on such farms are much less than they would have been had the land been properly prepared. Fertilization goes hand in hand with good farm practices, and the maximum economic returns from the use of fertilizer can only be obtained through the intelligent application of these plant foods, on properly cultivated lands.

GENERAL RATES OF APPLICATION ON GRAIN CROPS

The practice of fertilizing grain crops has become so general that rates of application can be given for nearly every farming district.

The range in rate of application recommended for cereal grains including flax and barley is from 30 to 60 lbs. of (11-48) Ammonium Phosphate, or from 40 to 70 lbs. Triple Superphosphate. In general, heavy soils under reasonable rainfall or subsoil moisture will respond more economically to the higher rates. The lighter rates of application are recommended in regions of lighter rainfall and subsoil moisture conditions. In dry areas reducing the rate of seeding wheat by one peck and using 30 lbs. (11-48) Ammonium Phosphate per acre will be most profitable.

On wooded soil areas, (16-20) Ammonium Phosphate is to be used from 60 to 100 lbs. per acre.

Rates of application or other information for your district can be obtained from any office of Consolidated Mining & Smelting Co. Ltd.—Edmonton, Calgary, Regina, Saskatoon, Winnipeg, or from any of the 400 Elephant Brand dealers.

HAY AND PASTURE CROPS

The legumes, Alfalfa and clovers, are deep rooted plants, and when inoculated have the power to fix considerable nitrogen from the air. Increased yields are obtained by applying (11-48) Ammonium Phosphate or Triple Superphosphate to old and new stands. Ammonium Phosphate is preferred, because it penetrates deeper into the soil. Apply to old stands in the Fall or in the early Spring with a combination fertilizer and grain drill at the rate of 100-lbs. per acre. For new stands drill in with a fertilizer grain drill 60 to 75 lbs. per acre with the seed. In the wooded soil areas for clovers, (16-20) Ammonium Phosphate should be used. This fertilizer supplies sulphur which is needed on these soils in addition to the other fertilizing elements.

Hays, Timothy, Brome Grass, and Red Top are shallow rooted plants and require nitrogen, phosphates, and potash for high yields. On prairie soils potash is not required, hence (16-20) Ammonium Phosphate, at the rate of from 100 to 150 lbs. per acre will rejuvenate old stands. Apply with a grain fertilizer drill early in the Spring. For new seedings use the same fertilizer, (16-20) Ammonium Phosphate, at the rate of 60 to 75 lbs. per acre, and drill in with the seed. Apply 100 lbs to the crop in the second year either (16-20) Ammonium Phosphate or Ammonium Sulphate

PASTURE CROPS

100 lbs. (16-20) Ammonium Phosphate applied in the Spring to worn out pastures, and an intermittent top dressing with similar quantity of Ammonium Sulphate, will give many more pasture days to stock and produce higher quality protein and mineral food for livestock.

FERTILIZERS FOR SUGAR BEETS AND ROOT CROPS

In fertilizing sugar beets care should be taken to obtain even distribution of fertilizer, and to place a portion of it with the seed in moist soil. The remainder of the application should be distributed in close proximity to the drill row but out of direct contact with the seed.

Neither proper germination nor maximum benefits from the fertilizer will be obtained if they are placed in dry loose soil.

Root crops are heavy feeders, and they respond to higher applications of fertilizer than are used on the grain crops.

On average soils the (11-48) Ammonium Phosphate fertilizer is recommended at the rate of 100 lbs. per acre. The Triple Superphosphate fertilizer at the rate of 120 pounds may be used on land that has been heavily manured with barnyard manure, or land that has grown legumes for a number of years. Ammonium Phosphate will probably give slightly better results under these conditions than Triple Superphosphate because of the available nitrogen which aids in early growth.

In general, the same applications recommended for beets will apply to other root crops.

For root crops in the garden, see directions under garden crops.

FERTILIZERS FOR POTATOES

Fertilizers not only increase yields, but they promote early maturity and increase the percentage of marketable size potatoes.

Under large scale operations, the potatoes are planted with a potato planter, for which a fertilizer attachment can be obtained.

Where fertilizers are used on small garden plots, care should be taken to avoid placing the potato seed in contact with the fertilizer; scatter a teaspoonful of fertilizer in the potato hill or furrow, cover or mix with a thin layer of soil, and then plant the seed.

Extensive experiments on western soils show that while (11-48) Ammonium Phosphate greatly increases yields, the addition of small quantities of Potash with Ammonium Phosphate, in many cases, produces slightly greater yields. Where Ammonium Phosphate alone is used apply at the rate of 150 to 250 pounds per acre.

Triple Superphosphate will increase potato yields on soils high in nitrogen or on garden plots that have been heavily manured.

FERTILIZER FOR CORN AND SUNFLOWERS

Under field conditions corn can be seeded with a combination fertilizer and corn planter. This machine places the fertilizer near the seed where the maximum benefit can be obtained from the plant food without it affecting germination.

High yields of corn, earlier maturity, and mature seed ears are secured by fertilizing with from 50 to 100 lbs. of (11-48) Am-

monium Phosphate to the acre. Fertilized corn withstands late Spring frosts and drouth better than an unfertilized crop. Apply fertilizers with a corn planter attachment.

Use similar rates and drilling methods for sunflowers.

FERTILIZER FOR LAWNS

Grasses require rich soils. They are shallow rooted plants and soon deplete the surface soil of its original supply of available plant food. It is therefore essential to maintain a fertile soil if a fast growing, thick rooted stand of grass is to be obtained.

The texture of the soil is important, as it is related to the water holding capacity. The texture of heavy clays and sandy soils may be improved by additions of organic matter in the form of barnyard manure while preparing the soil for the seed.

Before seeding the lawn, broadcast Ammonium Phosphate at the rate of 1 pound to 200 square feet, and thoroughly mix with the soil by spading. Top dressings of Ammonium Sulphate or Ammonium Phosphate at the rate of 1 pound to 200 square feet should be applied at intervals of six weeks during the summer.

A top dressing of Ammonium Phosphate at the rate of 1 pound to 200 square feet will improve the growth on old lawns that are becoming patchy through lack of plant foods.

Never top dress a lawn with fertilizer when the grass is wet. Apply fertilizer to the dry lawn and wash into the grass roots by sprinkling.

An initial application of Ammonium Phosphate at the beginning of the season followed by intermittent applications of Ammonium Sulphate during the summer will promote deep rooted thick velvety green grass.

GARDEN CROPS

It is not the purpose of this pamphlet to discuss garden practices, most gardeners being familiar with the cultural practices and crops best suited to their soils and climate, but rather to give instructions on methods and rates of application of fertilizers on garden crops.

Garden crops are heavy producers, and consequently heavy users of plant food. The short seasonal conditions of Western Canada demand rapid growth and early maturity, if the crop is to produce maximum yields and mature before the frost.

Phosphoric acid stimulates root development and promotes early maturity. Nitrogen promotes early stem and leaf growth. A combination of these two plant foods in the form of Ammonium Phosphate is recommended for use on the garden crops under prairie conditions and on prairie soils.

Garden seeds, such as peas, beans, potatoes, melons, cucumber, corn, etc., differ from the grain seeds in that they are sensitive to the direct contact of fertilizer.

If large quantities of fertilizer are applied in the row, it must be applied with care, otherwise injury to the young plant or seed

may result. In general, the closer a fertilizer can be placed to garden seeds without coming in direct contact, the better it promotes the early growth of the plant.

Fertilizers containing nitrate nitrogen cause the greatest injury, those of potash intermediate, and those containing phosphoric acid are least injurious to the young seedling.

The seed and fertilizer should be placed in a moist soil, therefore cultural practices should be arranged so as to disturb the soil as little as possible, and in this way prevent loss of moisture.

Fertilizers can best be applied by combination fertilizer seed planters, machines that place the fertilizer in the soil near the seed. Fertilizer may also be broadcast or distributed along the plant rows and mixed thoroughly with the soil before planting the seed.

When applying fertilizer to growing plants, do not allow the fertilizer to come in contact with the leaves or stalk, and when used on lawns apply when the grass is dry.

(11-48) Ammonium Phosphate is recommended for these crops under prairie conditions, at the rates given in the following table. These rates can be varied, but it should be remembered that these are concentrated fertilizers, and small quantities contain large amounts of plant food.

APPLICATION OF FERTILIZER TO GARDEN CROPS

Kind of Crop	Amount of Fertilizer Applied
Potatoes	12 ounces to a row 50 ft. in length.
Lettuce, Cabbage, Cauliflowers and leafy plants	10 ounces to a row 50 ft. in length.
Onions and Celery	8 ounces to a row 50 ft. in length.
Beets, Radishes, Carrots, Turnips and Parsnips	8 ounces to a row 50 ft. in length.
Peas, Beans and Sweet Corn	6 ounces to a row 50 ft. in length.
Cucumbers, Melons and Squash	1 ounce to each hill of four plants. Mix well with soil around plants.
Tomatoes	1 ounce to each plant.
Rhubarb	1—2 ounces to each plant.
Note.—One tablespoonful of fertilizer weighs approximately one ounce. One quart of fertilizer weighs approximately 2½ pounds.	

FLOWERS AND POTTED PLANTS

When preparing potting soil, add 1 teaspoonful of Ammonium Phosphate to one gallon of soil and mix well.

When applying fertilizer to growing plants in pots or flower beds, avoid placing the fertilizer close to the stalk, and mix with the surface soil at rates given below. These applications may be applied at intervals of six weeks to two months. The fertilizer can also be applied by dissolving in water and applied to the soil as a solution, but care must be taken to keep the solution away from the foliage.

Plants	Amount of Fertilizer Applied
Roses	1—2 ounces to each plant.
Potted Plants	1 teaspoonful to each 4 square ft. of surface soil, applied at six weeks to two month intervals.
Flower Beds	1 ounce per square yard.

SHRUBS AND SMALL FRUITS

Garden shrubs and small fruits, such as raspberries, blackberries, currants, etc., will respond to the application of Ammonium Phosphate.

It is essential that a phosphate fertilizer be placed in close proximity to the feeder roots of these plants, otherwise the plant may not obtain it. This may be accomplished by digging shallow trenches around the plant, or group of plants, within 6 to 10 inches of the shrub, and placing the fertilizer in these trenches, either in a dry form, or in solution, by first dissolving the fertilizer in water. Care must be taken, however, to prevent the solution coming in contact with the plants.

The application of approximately one ounce of Ammonium Phosphate to three square yards is recommended.

Strawberries—

Ammonium Phosphate will improve old strawberry beds and will promote growth and develop strong, vigorous plants on young beds the first season.

Apply the fertilizer to the young beds in the early Spring at the rate of approximately 150 pounds per acre for large areas, or one ounce to every two square yards on small areas.

Old strawberry beds should receive the same applications in the early summer immediately after the removal of the crop.

FERTILIZERS FOR SHADE AND FRUIT TREES

Shade and fruit trees respond to plant foods in the form of commercial fertilizers. These may be applied on the surface, or may be placed in the soil near the feeder roots.

Phosphate fertilizers applied to the surface soil may not benefit the tree, first, because it is in the drier portions of the soil, and may not obtain sufficient moisture to dissolve it readily, and second, even if brought into solution, phosphate fertilizer does not move downward to any appreciable extent in soils.

Fertilizers can best be applied to trees growing in sod lawns by digging a dozen or more holes, at intervals, around a tree by means of a pointed bar. The holes should be 8 to 12 inches deep and should be interspersed around the tree at distances of 2 to 3 feet from the tree trunk, depending on the size of tree, and extending out to a point below the outer branch tips. The fertilizer for the tree can be divided into a number of portions, depending on the number of holes, and can be placed in these holes, either in dry condition, or dissolved in water and applied in solution. The holes should then be filled with soil.

The greater the number of holes, the better will be the distribution of the fertilizer among the tree roots.

Applications of (11-48) Ammonium Phosphate are recommended at the rate of three-quarters of a pound per tree for young trees, increasing to three or four pounds for larger trees of six to ten years of age.

A PAGE FOR THE STOCKMAN

FERTILIZE YOUR CROPS

to increase phosphate content of feeds

Forage crops fertilized with Ammonium Phosphate showed 38% increase in phosphate content, besides increasing the total yield of the grasses, according to Dr. S. E. Clarke, Dominion Station, Manyberries, Alta.

Nygaard, Montana, has found large increases in yield and phosphate content of alfalfa when fertilized with phosphate fertilizers. Prof. J. H. Ellis, Manitoba Agricultural College, has found increases in Manitoba hay by fertilization.

and

Feed mineral phosphates (Elephant Brand Animal Builder) to insure balanced nutrition.

ELEPHANT BRAND Animal Builder Mono-Calcium Phosphate is not a proprietary patent stock food. It is a definite chemical compound, prepared for the purpose of supplying the practical livestock man with a cheap source of phosphorus, which is recognized by animal nutrition authorities as the limiting mineral food causing these deficiency diseases. It also supplies available calcium.

In areas of extreme phosphate deficiency, fertilize your feed crops and also feed "ANIMAL BUILDER" to your stock.

SYMPTOMS TO WATCH

1. Chewing bones, wood, leather or eating dirt, etc.
2. Poor appetite, emaciated condition, rough coats.
3. Swollen joints, stiffness, brittle bones, rickets, limberleg, etc.
4. Difficulty of breeding, failure to breed entirely or only every other year.
5. Weak offspring, calves, lambs, pigs, etc. Slow growing colts, calves, lambs.
6. Decreased milk flow, while on heavy feed, and rapid loss of flesh of milk cows.

Heavy producing dairy animals, young growing stock are in need of heavy supplies of phosphate and calcium.

THE SOLUTION

The solution to the important problem of mineral deficiency in feeds is:

1. Fertilize crops with phosphate fertilizers.
2. Feed Animal Builder Mono-Calcium Phosphate as a mineral supplement the year round to insure ample supplies of these important elements.

ELEPHANT BRAND FERTILIZERS

Increase Crop Returns

1. Lower production costs.
2. Earlier ripening.
3. Increased yields.
4. Higher grades.
5. Fewer weeds.

FERTILIZED CROPS

Resist damage and loss from

1. Late Spring frosts.
2. Wind blowing and soil drifting.
3. Plant diseases, root rot, blight, etc.
4. Insect damage, wire worm, cutworm.
5. Weed competition.
6. Rust.
7. Early Fall frosts.

Thousands of farmers are making profits from fertilizer.

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Sales of fertilizers during the past five years have proven their value each year on thousands of farms. Farmers using Elephant Brand Fertilizers realized higher yields and better quality grain not only in normal years but also in (1) dry years; (2) early fall frost years; (3) rust years. Barley growers using fertilizers received higher yields and premium prices for malting barley. Oats, flax, alfalfa, sugar beet and canning crop growers loudly praise fertilizers for producing higher revenue per acre. **Thousands of satisfied customers are the proof that fertilizers are soon to be universally used on the prairies.**

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November, 1936.

RAY E. NEIDIG,
Director of Agriculture.

THE CONSOLIDATED MINING & SMELTING COMPANY
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